

DISCUSSION OF THE AMENDMENTS

Claims 1-5 were previously cancelled.

Claims 6 and 7 are currently amended.

Claims 8-11 were previously presented.

Upon entry of the amendment, claims 6-11 will be active.

The amendments to claims 6 and 7 are supported by claim 6 as previously presented.

No new matter has been added.

REMARKS

The Office rejected claims 6-8 under 35 U.S.C. §103(a) over Adams (U.S. Patent No. 3,161,670). Further, the Office rejected claim 9 under 35 U.S.C. §103(a) over Adams and Boelt (U.S. Publication No. 2003/0220530). In addition, the Office rejected claims 10 and 11 under 35 U.S.C. §103 over the combination of Adams and Gussow et al. (U.S. Patent No. 4,558,168). The Office also provisionally rejected claims 6-8 on the ground of nonstatutory obviousness-type double patenting over claims 4-7 of Application No. 10/584,785 in view of Boelt and claims 10 and 11 over Application No. 10/584,785 in view of Gussow. In addition, the Office provisionally rejected claims 6-9 on the ground of nonstatutory obviousness-type double patenting over claims 5-10 of Application No. 10/584,783 and claims 10 and 11 over the same in view of Gossow. The Office also provisionally rejected claims 6-9 on the ground of nonstatutory obviousness-type double patenting over claims 7-18 of Application No. 11/718,814 in view of Boelt. Finally the Office rejected claims 6-9 on the ground of nonstatutory obviousness-type double patenting over claims 1-5 of U.S. Patent No. 7,034,195 in view of Boelt.

The disclosure relates to a process for preparing butadiene. The process involves nonoxidatively catalytically dehydrogenating butane to obtain a product gas stream containing butane, 1-butene, 2-butene, butadiene, hydrogen and secondary constituents. The 1-butene and 2-butene of the product gas stream is then oxidatively dehydrogenated to give a second gas stream containing butane, 2-butene, butadiene, hydrogen, steam and secondary constituents. Next, the butane, 2-butene and butadiene are separated from the second gas stream and the butane and 2-butene are then separated from the butadiene product. The butane and 2-butene are then recycled into the nonoxidative catalytic dehydrogenating zone.

Applicants submit that of the cited references do not teach or suggest at least one second dehydrogenation step involving oxidatively dehydrogenating 1-butene and 2-butene to obtain a product gas stream containing n-butane, 2-butene, butadiene, hydrogen, secondary constituents and steam. In addition, the cited references do not teach or suggest obtaining a C₄ product gas stream that substantially consists of n-butane, 2-butene and butadiene then isolating the butadiene product by extractive distillation and recycling the remaining n-butane and 2-butene

into the first dehydrogenation zone. Accordingly, the claimed process would not have been rendered unpatentable under 35 U.S.C. §103(a) over the cited references.

The rejection of claims 6-8 under 35 U.S.C. §103(a) over Adams is respectfully traversed.

Adams describes a process for preparing olefinic compounds. The process involves preheating alkanes followed by dehydrogenation in a first reactor over a catalyst followed by dehydrogenation in a second reactor in the presence of an oxygen containing gas. Adams then describes separating H₂O, H₂, product and unreacted feed in a separation zone where the unreacted feed is recycled into the first reactor. Adams describes products such as alpha, beta-olefinic aldehyde, alpha, beta-olefinic nitrile or 1,3-diolefin. The Office concludes that since Adams lists butane as a feed stock that butadiene product may be formed in the Adams process.

Applicants agree with the Office that the process described in Adams may produce butadiene from butane. However, the claimed process for producing butadiene from butane differs significantly from the process described in Adams. First, Adams does not specifically describe the selective oxidative dehydrogenation of 1-butene and 2-butene into a product gas stream containing n-butane, 2-butene, butadiene, hydrogen, secondary constituents and steam. Applicants note that an oxidative dehydrogenation process can yield various products depending upon reaction conditions. Adams only generically describes oxidative dehydrogenation with no specificity as what is being dehydrogenated. Adams provides no teaching of this specific oxidation dehydrogenation step.

Second, Adams simply separates out product (butadiene), H₂ and H₂O and recycles everything else from the second reactor back into the first reactor. In contrast, the claimed process first separates out n-butane, 2-butene and butadiene (product) as described in step D) of claim 1. In a second separation step E) the claimed process isolates the butadiene product from the butane and 2-butene and the recycles the butane and 2-butene back into the first dehydrogenation zone. Adams recycles everything back into the first reactor without isolating only butane and 2-butene. Accordingly, Adams does not teach or suggest all the recitations of

the claimed process; and therefore, the claim process; would not have been obvious over Adams. As such, Applicants respectfully request that the Office withdraw the rejection of claims 6-8 under 35 U.S.C. §103(a) over Adams.

With respect to claim 7, Applicants note that Adams does not teach or suggest an autothermal nonoxidative catalytic dehydrogenation step. Adams clearly preheats the feed stock (Figure showing preheater 14 and column 3, lines 27-31) so that Adams does not describe an autothermal process. Accordingly, Adams does not teach or suggest the recitations of claim 7, and therefore, Applicants respectfully request that the Office withdraw the rejection of claim 7 under 35 U.S.C. §103(a) over Adams.

The rejection of claim 9 under 35 U.S.C. §103(a) over the combination of Adams and Boelt is respectfully traversed.

Boelt does not make up for the deficiencies of Adams as discussed above. Accordingly, Applicants respectfully request that the Office withdraw the rejection of claim 9 under 35 U.S.C. §103(a) over the combination of Adams and Boelt.

The rejection of claims 10 and 11 under 35 U.S.C. §103(a) over Adams and Gussow is respectfully traversed.

Gussow does not make up for the deficiencies of Adams as discussed above. Accordingly, Applicants respectfully request that the Office withdraw the rejection of claims 10 and 11 under 35 U.S.C. §103(a) over the combination of Adams and Gussow.

With regard to the provisional rejections of the claims on the ground of nonstatutory obviousness-type double patenting, Applicants request that the Office hold some of these rejections in abeyance.

Specifically, claims 4-7 of Application No. 10/584,785, claims 5-10 of Application No. 10/584,783 and claims 7-18 of Application No. 11/718,814 are not, as yet patented.

Accordingly, Applicants respectfully request that these rejections be held in abeyance and the claims in these applications be addressed individually in due course.

The rejection of claims 6-9 on the ground of nonstatutory obviousness-type double patenting over claims 1-4 of U.S. Patent No. 7,034,195 (Schindler) and Boelt is respectfully traversed.

Schindler describes a method for the production of butadiene from butane. In Schindler 1-butene and 2-butene are oxidatively dehydrogenated to butadiene in a second dehydrogenation zone and gives a gas product of butadiene, butane, steam and secondary components. In contrast, the claimed method oxidatively dehydrogenates 1-butene and 2-butene to give a gas product containing n-butane, 2-butene, butadiene, hydrogen, secondary components and steam. Schindler does not yield 2-butene in this second dehydrogenation step whereas the claimed process does yield 2-butene. Accordingly, Schindler does not teach or suggest all the recitations of the claimed method. Similarly to Schindler, Boelt does not teach or suggest the all recited steps of the claim method, and therefore, the claimed process would not have been obvious over the combination of Schindler and Boelt. Accordingly, Applicants respectfully request that the Office withdraw the rejection of claims 6-9 on the ground of nonstatutory obviousness-type double patenting over Schindler and Boelt.

Applicants have amended the Abstract such that the Abstract is in compliance with MPEP §608.01(b), and therefore, Applicants request that the objection to the Abstract be withdrawn.

Finally, Applicants note that claims 6 and 7 have been amended such that they are free of the criticisms outlined on page 2 of the Office Action. Accordingly, the rejection of claims 6-11 under 35 U.S.C. §112, second paragraph should be withdrawn.

In view of the above remarks, Applicants believes the pending application is in condition for allowance. Favorable reconsideration is respectfully requested.

Application No. 10/584,758
Amendment dated February 12, 2008
Reply to Office Action of December 31, 2007

Docket No.: 13156-00058-US1

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 03-2775, under Order No. 13156-00058-US1 from which the undersigned is authorized to draw.

Dated: February 12, 2008

Respectfully submitted,
Electronic signature: /Donald K. Drummond,
Ph.D./
Donald K. Drummond, Ph.D.
Registration No.: 52,834
CONNOLLY BOVE LODGE & HUTZ LLP
1875 Eye Street, NW
Suite 1100
Washington, DC 20006
(202) 331-7111
(202) 293-6229 (Fax)
Attorney for Applicant